LOVELY PROFESSIONAL UNIVERSITY

Transforming Education Transforming India

Orientation to Computing-I

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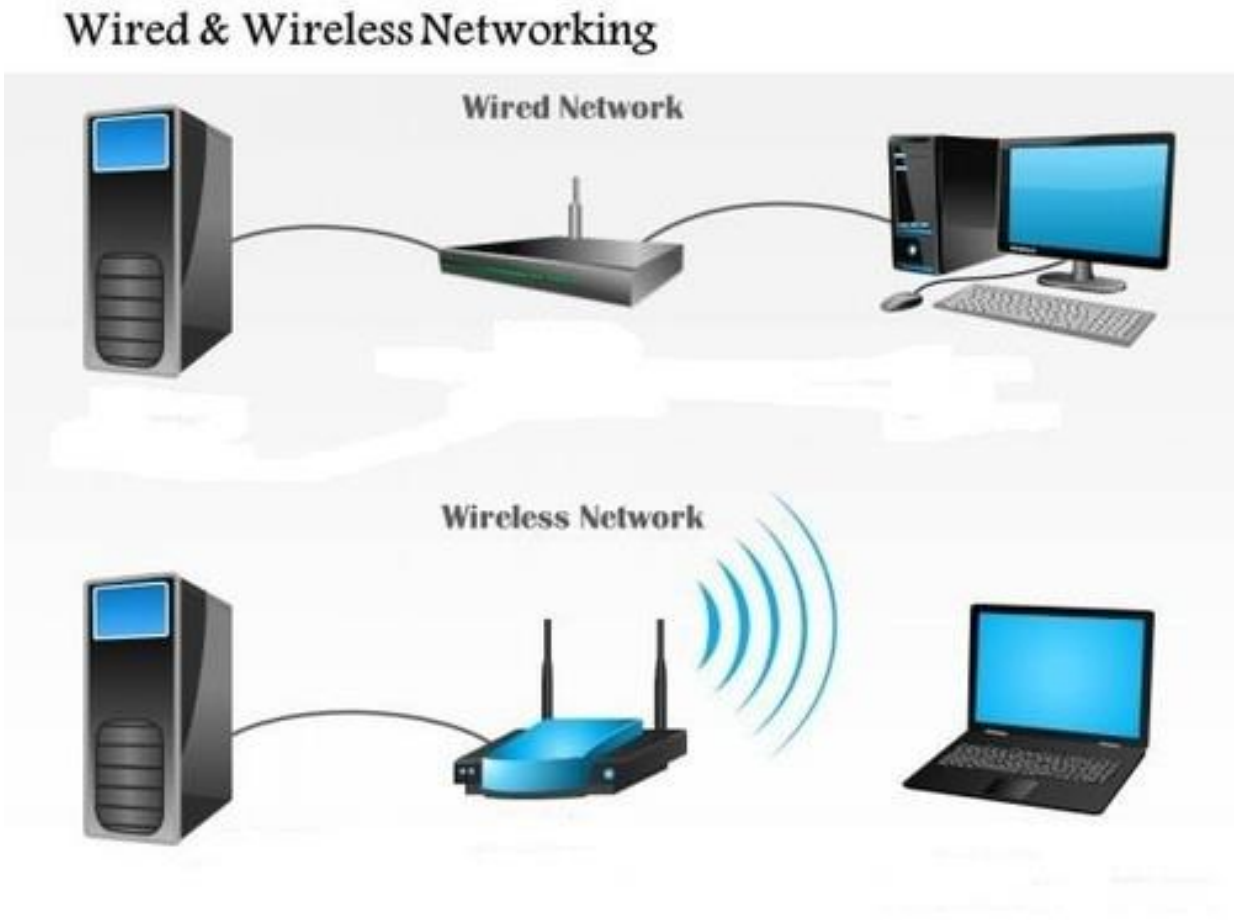
Unit-5 (Computer Network and Communication)

- Network types (wired and wireless), Network topologies, Network communication devices (Routers, Switches, Modems, Hubs, access point),
- Setting IP addresses, sharing files and folders, Remote Login, SSH, Wireless Security (http vs https), Client Server model, Types of Servers (Proxy servers, Application server, Web server, File server, Database server, Synchronization server, Log server).

Unit-5 (Cloud Computing)

- Types of Cloud (Public, Private, Hybrid, Community)
- Cloud based services(SaaS, PaaS, IaaS, FaaS)
- Virtualization Types
- Hypervisor Types (Type 1 and Type 2)
- Major Cloud service providers

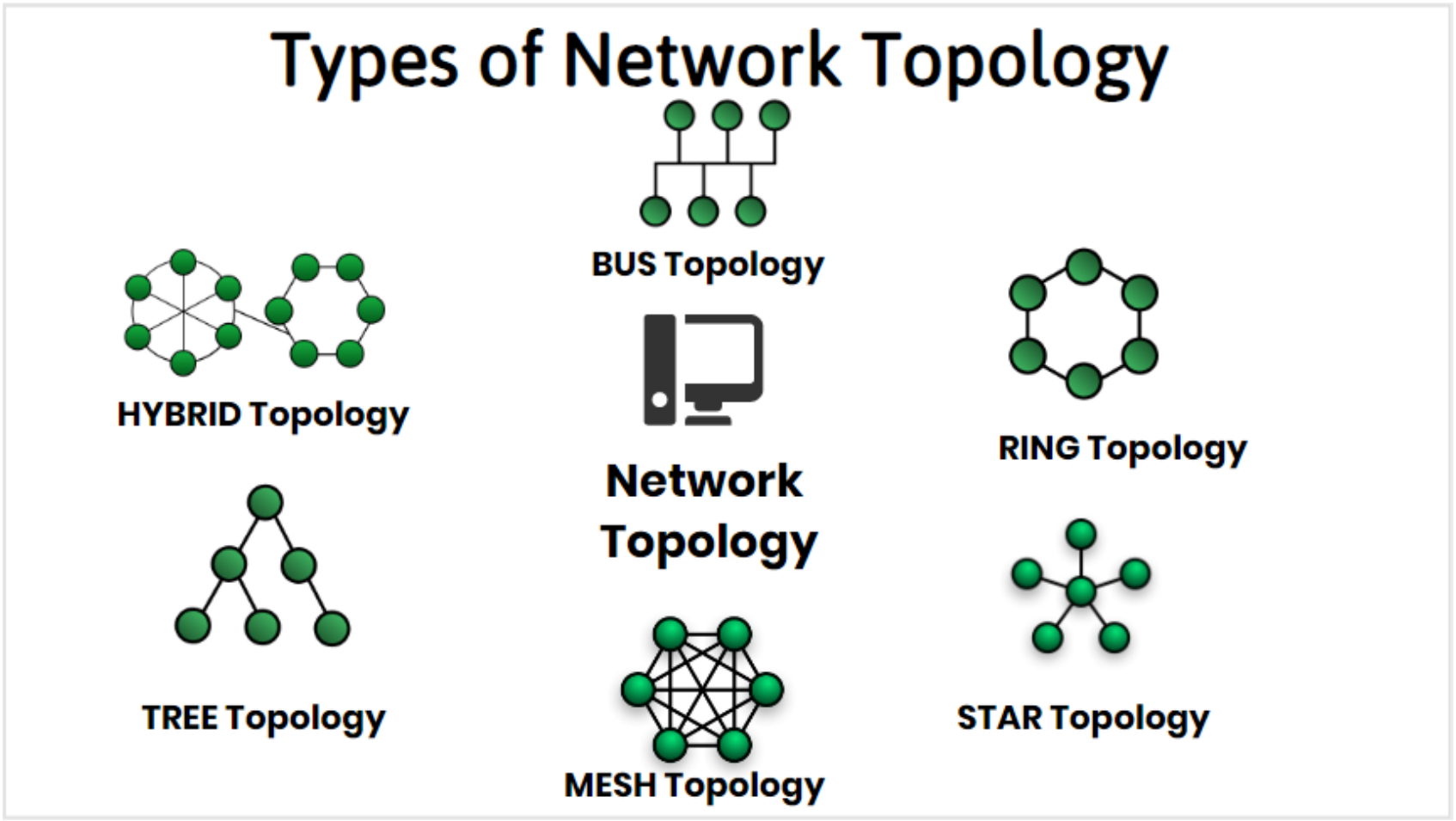
Types of Network



Types of Computer Network

Category	Wireless Network	Wired Network
User mobility	Nearly unlimited in building	Tethered to a physical outlet
Office reconfigurations	Simple	Messy and higher cost
Reliability	Mixed results	Generally better
Potential RF interference	Significant concern	Not an issue
Environment constraints	Can impact signal	Distance from switch only issue
Security	Less secure	More secure than wireless
Connection speeds	Usually slower than wired	Faster than wireless and not shared
Support/troubleshoot	Often more difficult	Physical layer straightforward
Switch ports	One per WAP	One needed for each live outlet
Setup cost	Relatively low	More expensive

Network Topologies



Types of Network Topologies

Bus Topology: Bus topology is the kind of network topology where every node, i.e. every device on the network, is connected to a solo main cable line

Ring Topology : Ring Topology is a topology type in which every computer is connected to another computer on each side.

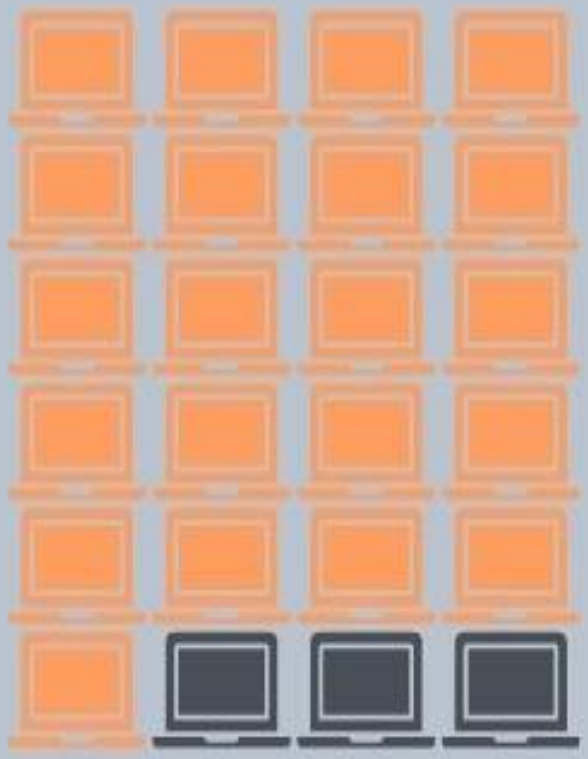
Star Topology: Star Topology is the kind of network topology in which all the nodes are connected via cables to a single node called a hub, which is the central node. The hub can be active or passive in nature.

Mesh Topology: Mesh topology is the kind of topology in which all the nodes are connected with all the other nodes via a network channel.

Tree Topology: Tree topology is the topology in which the nodes are connected hierarchically, with all the nodes connected to the topmost node or root node.

Hybrid Topology :A Hybrid Topology is basically a network topology comprising two or more different types of topologies. It is a reliable and scalable topology, but simultaneously, it is a costly one.

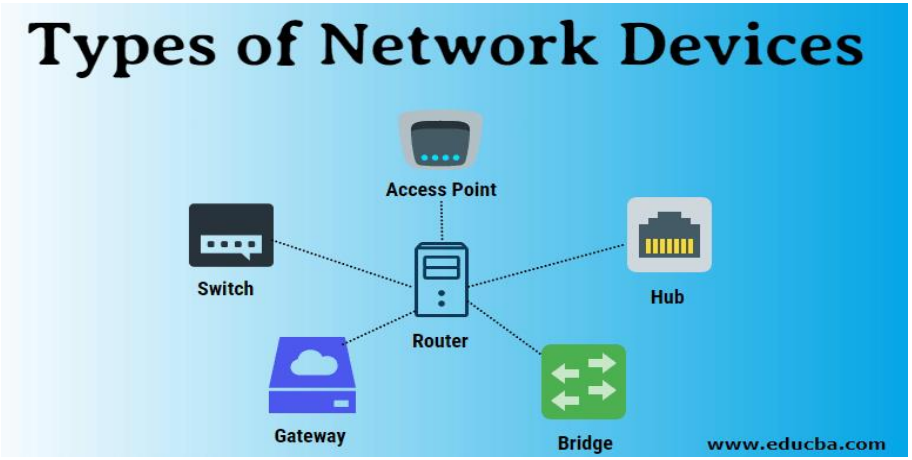
Do you know….



OVERALL INTERNET AT PRESENT CONSISTS OF 5 BILLION COMPUTING DEVICES

Network Communication Devices

There are different types of network devices through which the transmission occurs. These devices act as intermediates between the source and destination. These devices are also sometimes referred to as nodes or hosts and paths to find out the best paths which help them for communication.



- **Router**: It is also known as a layer-3 device of the Open Standard Interface (OSI) model. It adds the source and destination address with the data packets it receives. This facilitates the data packets to easily reach to their corresponding destination.

Network Communication Devices

- **Hub:** It is a layer-2 device of the OSI model. It sends the frames (layer-2) to all the devices connected to a network. Hubs are usually used by LAN to connect it's all segments. It is comprised of multiple ports so that whenever any fame arrives at one port, it is copied to the other ports so that all segments of the LAN can see all packets.
- **Switch:** A switch is another important networking device which is commonly known as intelligent Hub. It also works on layer -2 of OSI model but it maintains the record of all Media Access Control (MAC) addresses of the connected devices, therefore whenever the same device sends the request for transmission through a switch it checks its record if the entry of the MAC address of that device is found it send the data to that destination immediately on the other hand if the entry is not found it adds the new entry for the newly connected device. This function makes a switch more efficient than a Hub

Difference

Comparison chart

	Hub	Switch
Layer	Physical layer. Hubs are classified as Layer 1 devices per the OSI model.	Data Link Layer. Network switches operate at Layer 2 of the OSI model.
Ports	4/12 ports	Switch is multi port Bridge. 24/48 ports
Device Type	Passive Device (Without Software)	Active Device (With Software) & Networking device
Transmission Type	Hubs always perform frame flooding; may be unicast, multicast or broadcast	First broadcast; then unicast & multicast as needed.
Table	A network hub cannot learn or store MAC address.	A network switch stores MAC addresses in a lookup table.
Data Transmission form	Electrical signal or bits	Frame (L2 Switch) Frame & Packet (L3 switch)
Transmission Mode	Half duplex	Full duplex
Function	To connect a network of personal computers together, they can be joined through a central hub.	Allow to connect multiple device and port can be manage, Vlan can create security also can apply
Used in (LAN, MAN, WAN)	LAN	LAN
Broadcast Domain	Hub has one Broadcast Domain.	Switch has one broadcast domain [unless VLAN implemented]
Definition	An electronic device that connects many network device together so that devices can exchange data	A network switch is a computer networking device that is used to connect many devices together on a computer network. A switch is considered more advanced than a hub because a switch will on send msg to device that needs or request it
Collisions	Collisions occur commonly in setups using hubs.	No collisions occur in a full-duplex switch.
Spanning-Tree	No Spanning-Tree	Many Spanning-tree Possible
Manufacturers	Sun Systems, Oracle and Cisco	Cisco and D-link Juniper

Network Communication Devices

- **Modems:** It is a device that enables a computer to send or receive data over telephone or cable lines. The data stored on the computer is digital whereas a telephone line or cable wire can transmit only analog data. The main function of the modem is to convert digital signal into analog and vice versa..
- **Access Points:** It is a device that creates a wireless local area network, or WLAN, usually in an office or large building. An access point connects to a wired router, switch, or hub via an Ethernet cable, and projects a Wi-Fi signal to a designated area.

Difference

DIFFEREBCE BETWEEN HUB SWITCH AND ROUTER

S.No	HUB	SWITCH	ROUTER
1.	Works in Half Duplex mode	Full Duplex	Full Duplex
2.	Sends data in form of bits	Sends data in form of frames	Sends data in form of packets
3.	Broadcast Device	Multicast device	Routing Device
4.	Works in physical layer of OSI model	Works in Data link / Network layer of OSI model	Works in Network layer of OSI model
5.	Used to connect devices to the same network.	Used to connect devices to the network.	Used to connect two networks.
6.	Does not store any MAC address of a node in the network.	Stores MAC address and IP address of nodes in the network.	Stores MAC address and IP address of nodes in the network.
7.	Types are :- Active hub, Passive hub and Intelligent hub.	Types are Layer 2 and layer 3 switch.	Types are Broadband router, Wireless router, Edge router, core router.
8.			

Activity-1

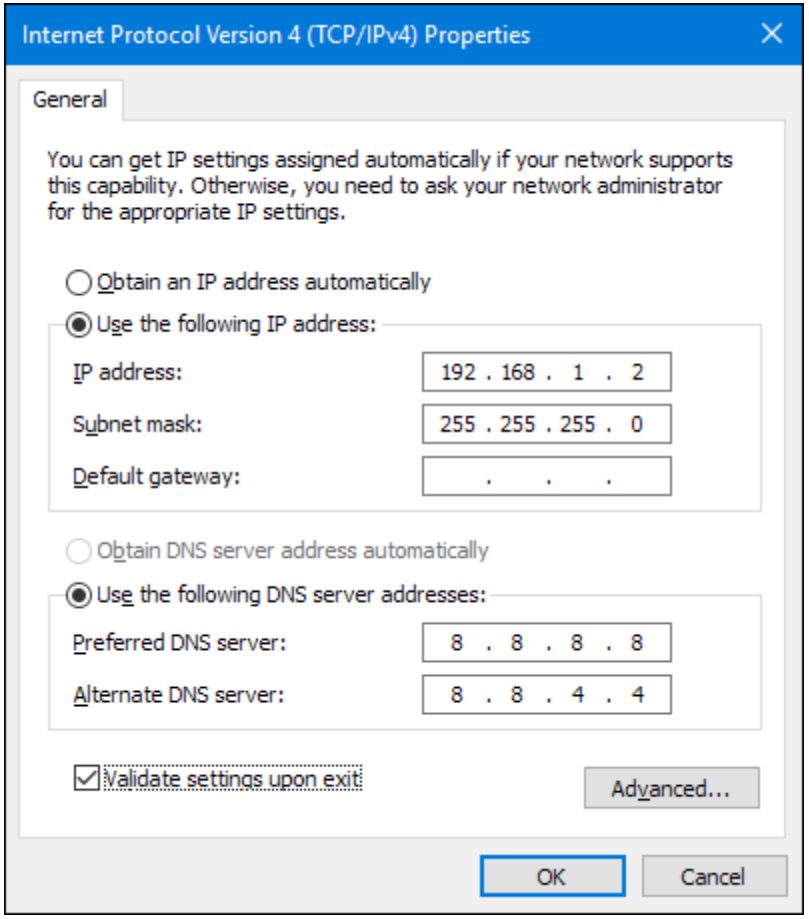
Show in packet tracer how topologies and networks work by sending data packets/ simple execution at tutor's end……

Setting IP Address

To set the IP address within Windows XP and Windows 2000, complete these steps….

- Click Start >Settings >Control Panel.
- On the control panel, double-click Network Connections.
- Right-click Local Area Connection.
- Click Properties.
- Select Internet Protocol (TCP/IP), and then click Properties.
- Select Use the Following IP Address.
- Complete the IP address, Subnet mask, and Default gateway fields by using the values in step 4 from Accessing the ASMI using a Web Browser.
- Click OK on the Local Area Connection Properties window. It is not necessary to restart your PC.

Activity -2 (Setting up your IP address)

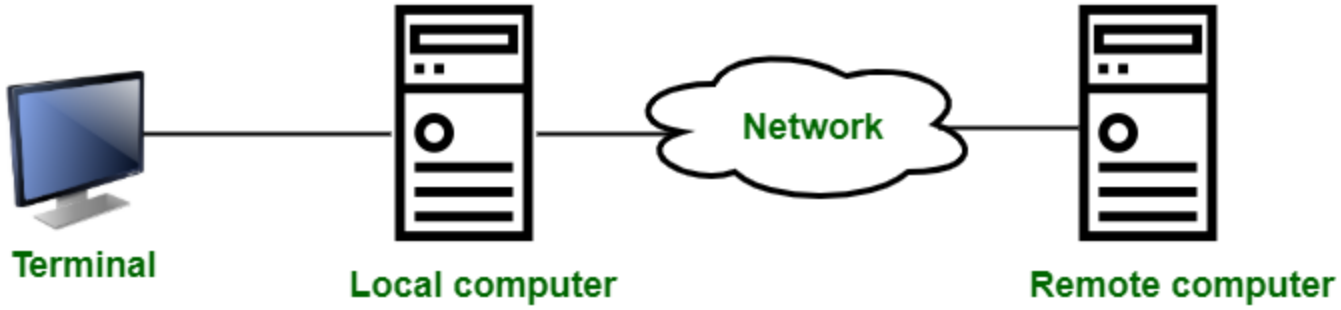


Activity-3 Sharing Files and Folders

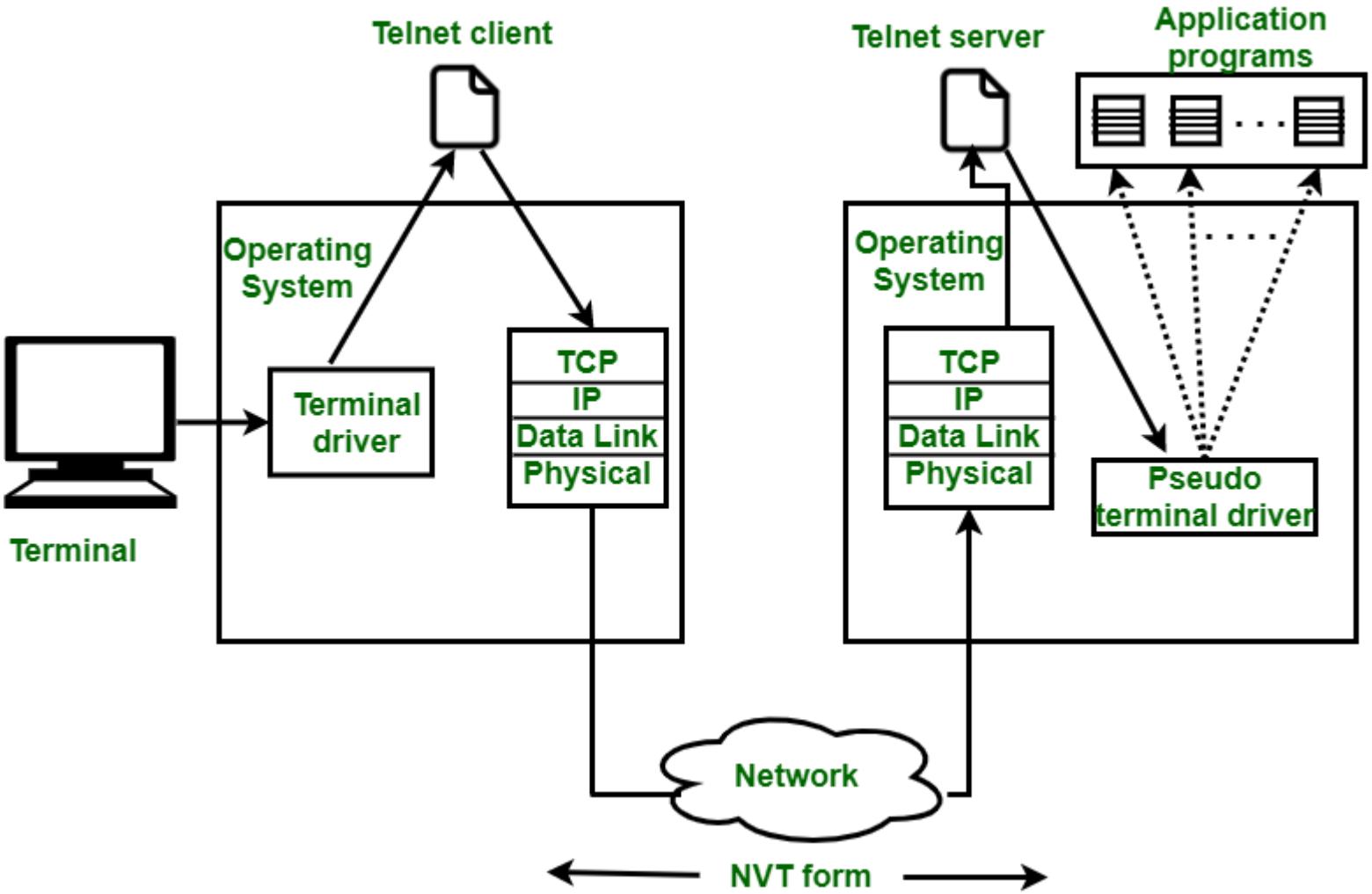
- File sharing over a network in Windows 10 allows you to share files and folders on your computer with other users over a private or public network in your workgroup or domain.
- You can set the permissions of a shared file or folder to allow groups or users to have a read only, change (modify), or full control access rights.
- Starting with Windows 10 version 1803, some features of file sharing over a network have changed, including the removal of HomeGroup. However, even though HomeGroup has been removed, you can still share printers and files by using features that are built into Windows 10.
- Right-click (or long-press) a file, and then select Show more options > Give access to > Specific people.
- Select a user on the network to share the file with, or select Everyone to give all network users access to the file..

Remote Login

- Remote Login is a process in which user can login into remote site i.e. computer and use services that are available on the remote computer.
- With the help of remote login a user is able to understand result of transferring result of processing from the remote computer to the local computer.



Activity-4 -Procedure of Remote Login :

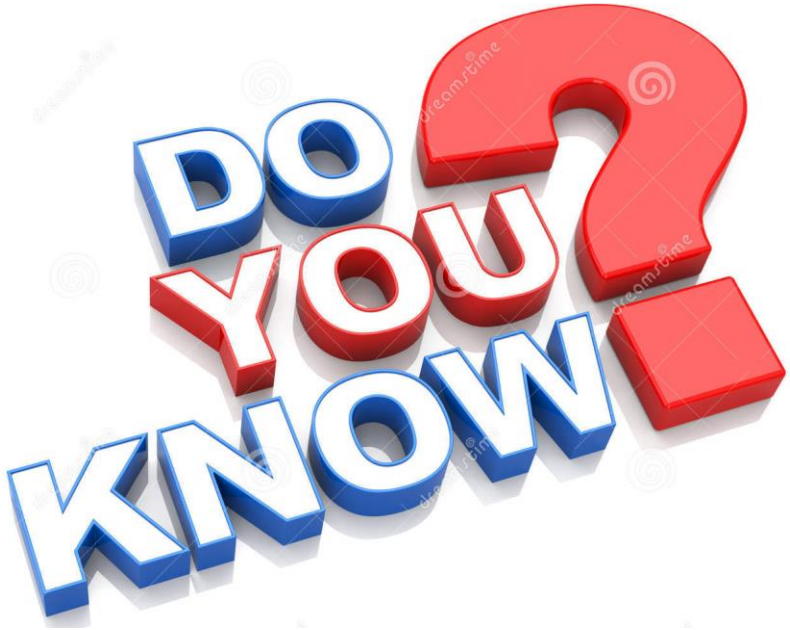


Activity-4

- It is implemented using Telnet.
- Procedure of Remote Login :
- When the user types something on local computer, then local operating system accepts character.
- Local computer does not interpret the characters, it will send them to TELNET client.
- TELNET client transforms these characters to a universal character set called Network Virtual Terminal (NVT) characters and it will pass them to the local TCP/IP protocol Stack.
- Commands or text which is in the form of NVT, travel through Internet and it will arrive at the TCP/IP stack at remote computer.
- Characters are then delivered to operating system and which later on passed to TELNET server.

Activity-4

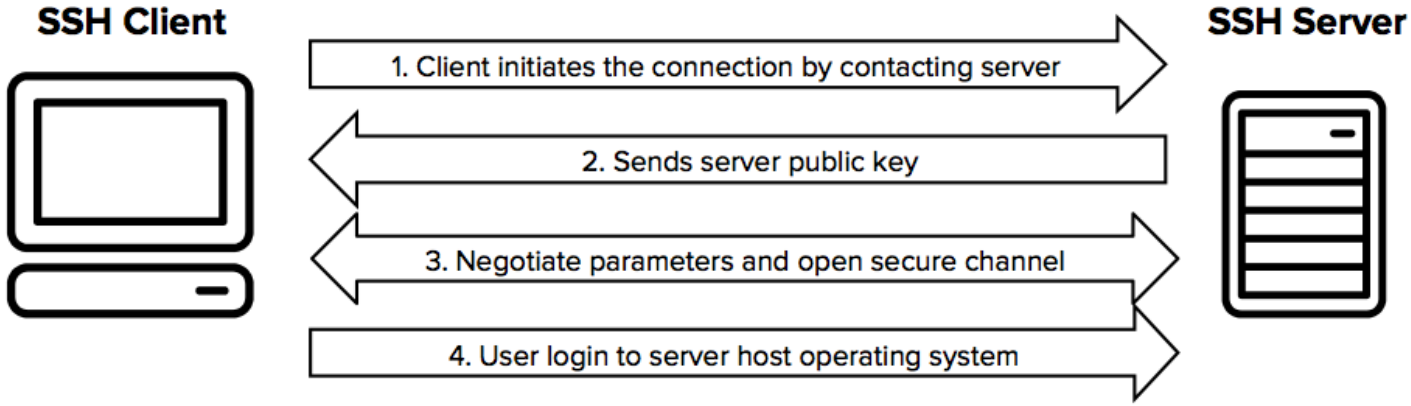
- Then TELNET server changes that characters to characters which can be understandable by remote computer.
- Remote operating system receives character from a pseudo-terminal driver, which is a piece of software that pretends that characters are coming from a terminal.
- Operating system then passes character to the appropriate application program.



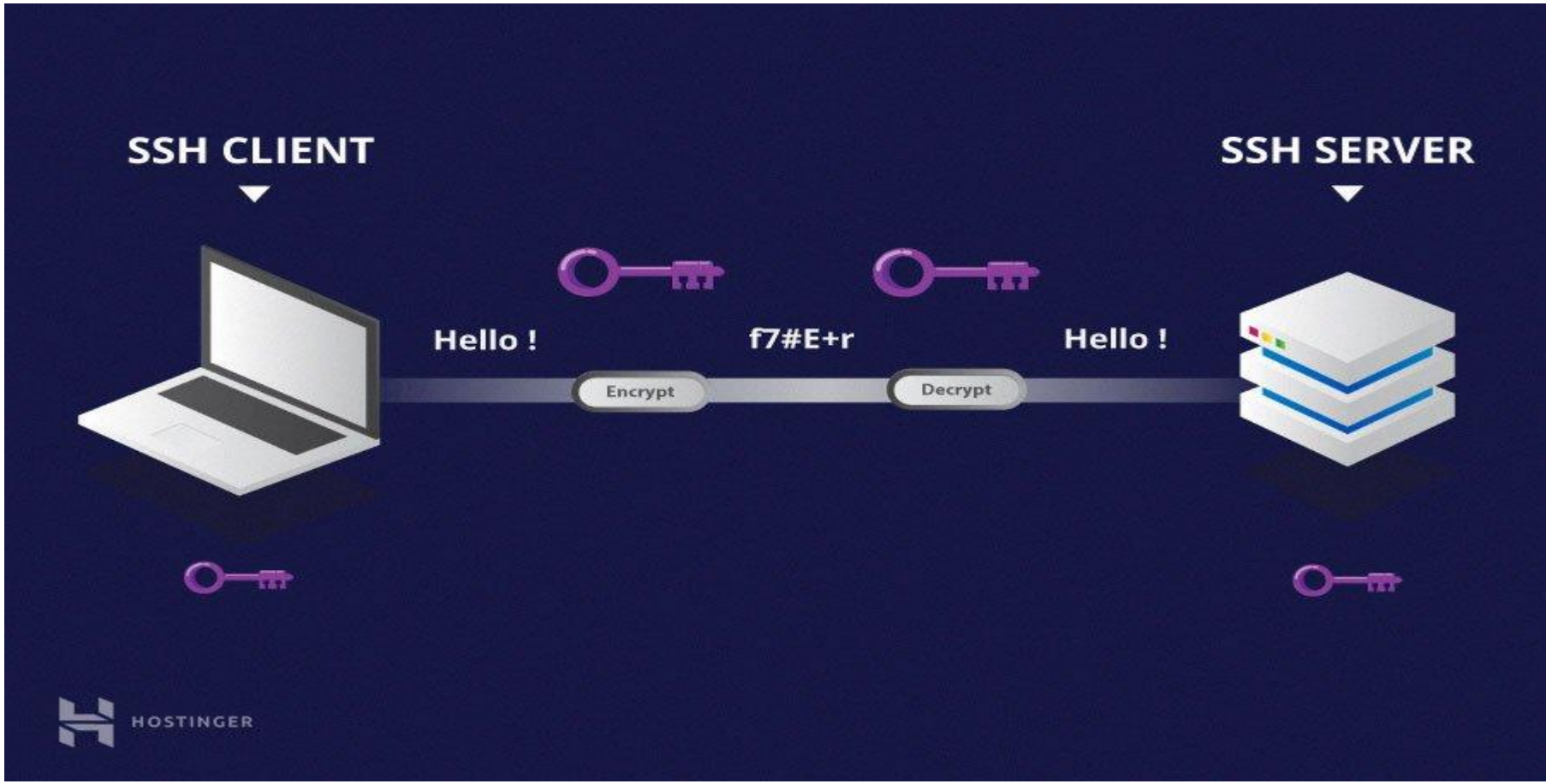
Approximately *204 million emails per minute* are sent over the Internet. 70% of them are spam

Secure Socket Shell (SSH)

- SSH, also known as Secure Shell or Secure Socket Shell, is a network protocol that gives users, particularly system administrators, a secure way to access a computer over an unsecured network.
- SSH also refers to the suite of utilities that implement the SSH protocol.
- Secure Shell provides strong password authentication and public key authentication, as well as encrypted data communications between two computers connecting over an open network, such as the Internet.



Understanding Different Encryption Techniques



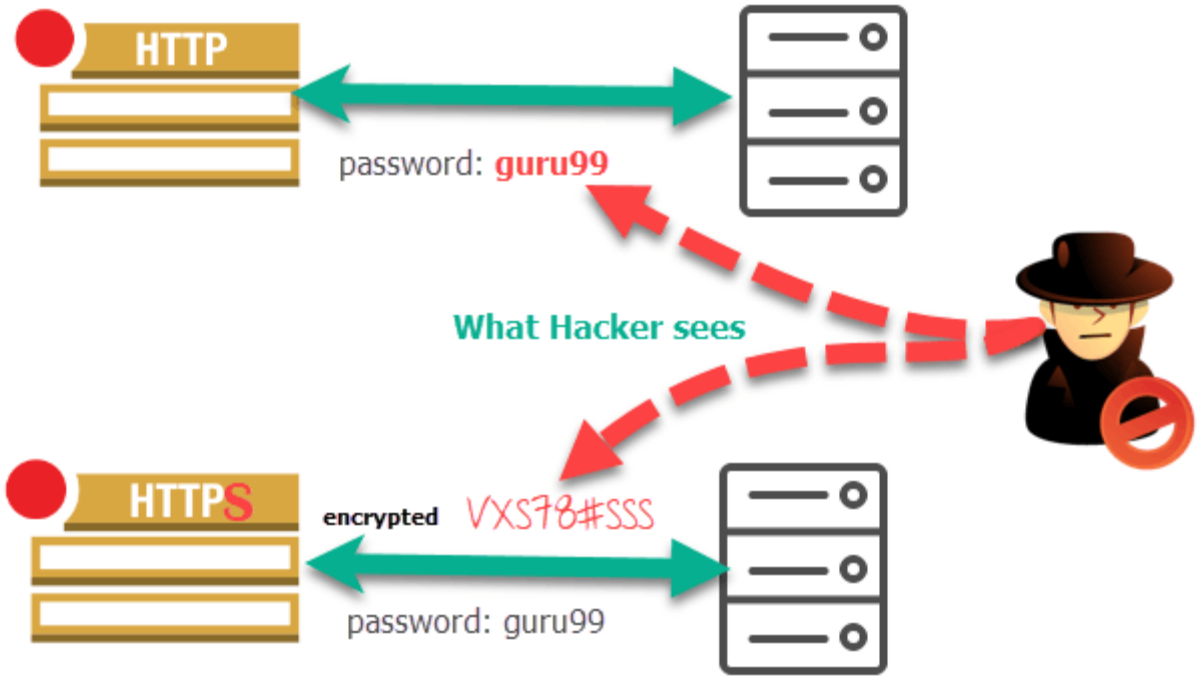
Wireless Security

- Wireless network security is the process of designing, implementing and ensuring security on a wireless computer network.
- It is a subset of network security that adds protection for a wireless computer network.
- Wireless network security primarily protects a wireless network from unauthorized and malicious access attempts.
- Typically, wireless network security is delivered through wireless devices (usually a wireless router/switch) that encrypts and secures all wireless communication by default.
- Even if the wireless network security is compromised, the hacker is not able to view the content of the traffic/packet in transit. Moreover, wireless intrusion detection and prevention systems also enable protection of a wireless network by alerting the wireless network administrator in case of a security breach

HTTP vs HTTPs

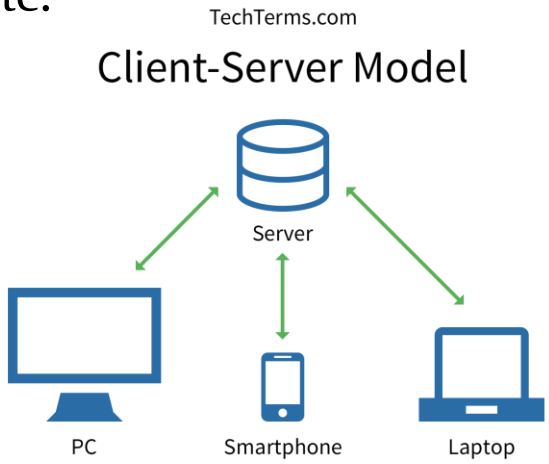
HTTP	HTTPS
URL begins with http://	URL begins with http://
The request is processed through port 80 by default	The request is processed through port 443 by default
Fast transfer of unencrypted data over a simpler protocol	Longer data transfer, as there are additional steps to provide encryption (handshake, certificate verification)
Not safe, vulnerable to MITM attacks and traffic interception	Safe- maximizes the complexity of traffic and information interception
Main purpose - data exchange on the Internet	Main purpose - confidential data exchange, including the exchange through unsafe networks.
Does not improve search ranking	Improves search ranking
Does not save data about the referring website and displays referral traffic as direct	Stores data about the referring websites and significantly increases the accuracy of analytic services
Does not support AMP	Is required for AMP
Is less trustworthy	Is more trustworthy
Perfect fit for blogs, forums, educational and entertainment websites	Perfect fit for commercial and financial websites, and services that require confidentiality of data

HTTP vs HTTPs



Client Server Model

- The Client-server model is a distributed application structure that partitions task or workload between the providers of a resource or service, called servers, and service requesters called clients.
- In the client-server architecture, when the client computer sends a request for data to the server through the internet, the server accepts the requested process and deliver the data packets requested back to the client. Clients do not share any of their resources. Examples of Client-Server Model are Email, World Wide Web, etc.



Working of Client Server Model

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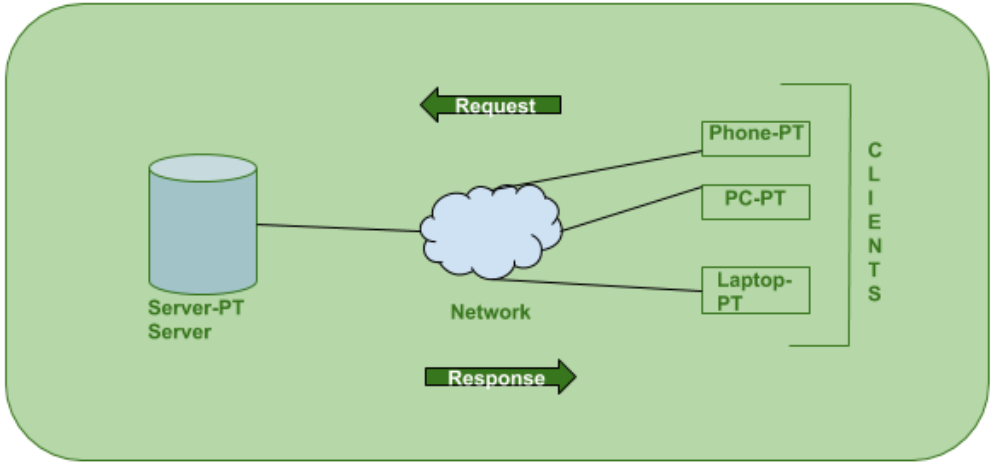
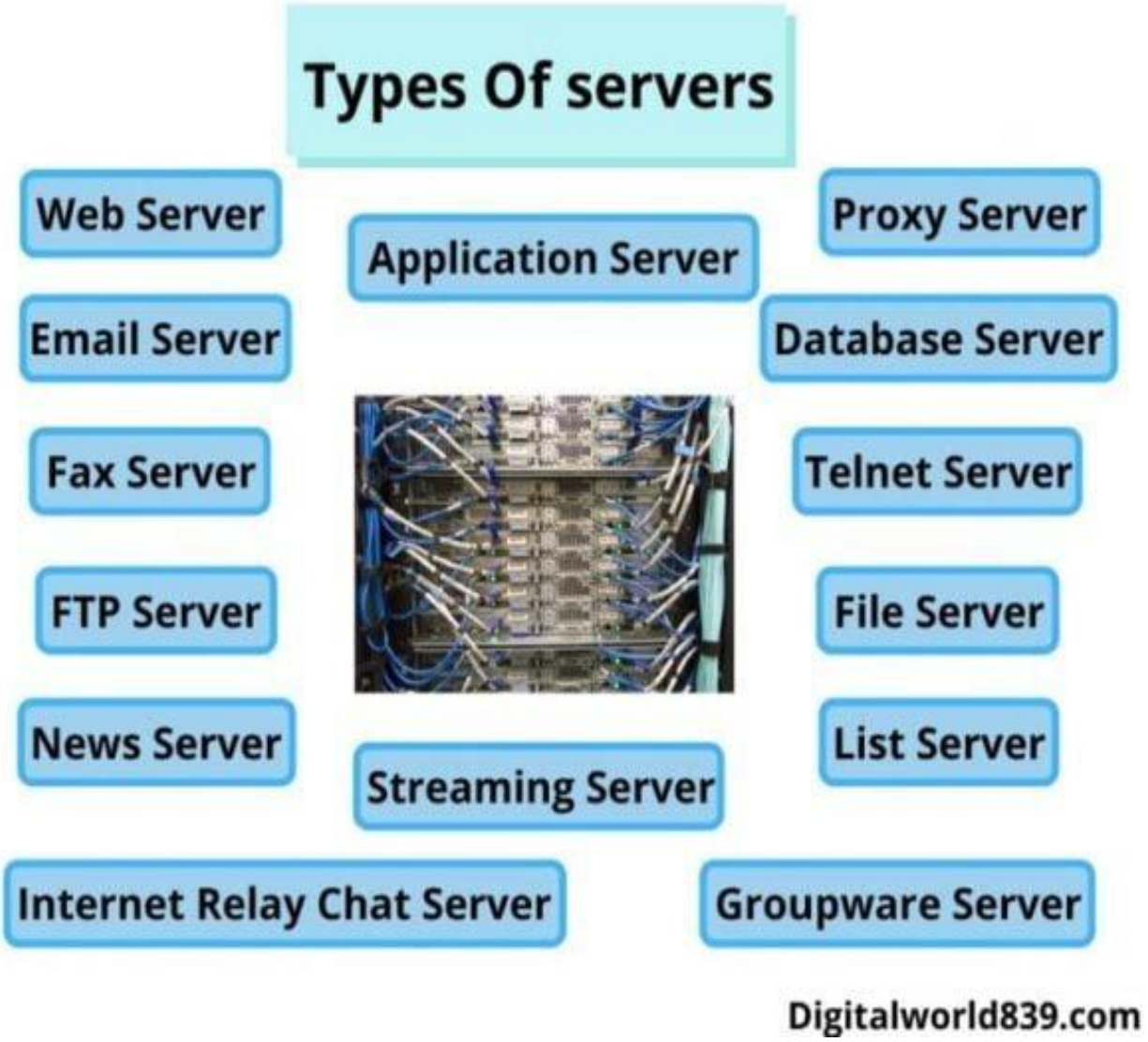



Types Of servers
Web Server
Application Server
Proxy Server
Email Server
Database Server
Fax Server
Telnet Server
FTP Server
File Server
News Server
List Server
Streaming Server
Internet Relay Chat Server
Groupware Server
Digitalworld839.com

Types of Server

- **Proxy server** commonly called “proxy”. It acts as a gateway between users and the internet. These types of servers are used for performance enhancement, privacy, and anonymous surfing. When a client connects to a proxy server and requests a service, its accessing IP address changes.
- **Application Server** is a framework, it is an environment where applications run. Application Server includes a server operating system (OS) and server hardware that provides computing-intensive operations and other services to the application.
- A **web server** is a server that runs on websites. It is also called a computer program. The main function of web servers is to store, process, and deliver.Whenever we search on the internet through web browsers like chrome, Mozilla, internet explorer, etc, receives the request for the URL and then web server sends the data according to the need of the user. These types of servers mainly show the data in format like images, text, video, etc.

Types of Server

- A **file server** is a network that helps to transfer stored files. The file server stores and manages all the files in a computer and sends a copy of the file to the other computer on the request of the users. It shares the storage of computer files such as documents, sound files, photographs, images, databases, etc. These types of servers is used mainly on the local network.

- A **database server** runs a database management system and provides database services to clients. The server manages data access and retrieval and completes client's requests.

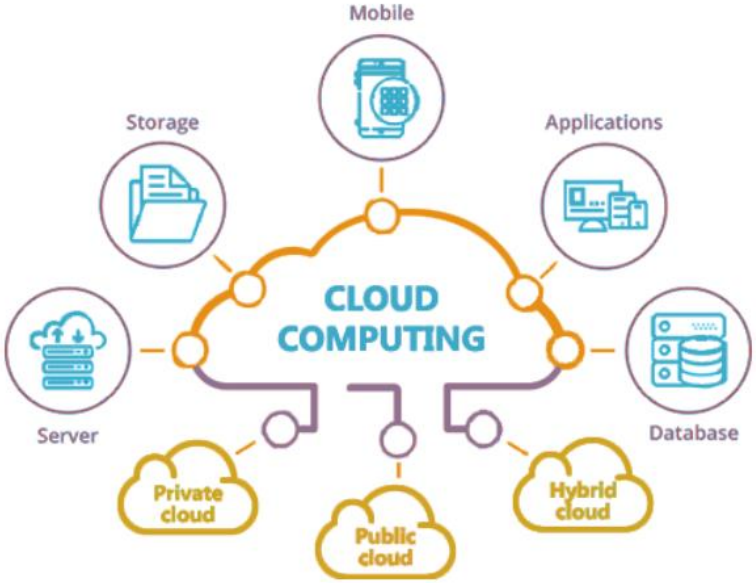
- **Server synchronization** allows to synchronize the database of two servers located on different systems. In this way, several servers can be synchronized with each other one after the other.

Types of Server

- A **log server** is a log file automatically created and maintained by a server consisting of a list of activities it performed. It maintains a huge server requests.
- Information about the request, including client IP address, request date/time, the page requested, HTTP code, bytes served, user agent, and referrer are typically added to the log server format.
- This data can be combined into a single file, or separated into distinct logs, such as an access log, error log, or referrer log. server logs typically do not collect user-specific information.
- These files are usually not accessible to general Internet users, only to the administrative person of Internet service.
- A statistical analysis of the server log may be used to examine traffic patterns by time of day, day of the week, referrer, or user agent.

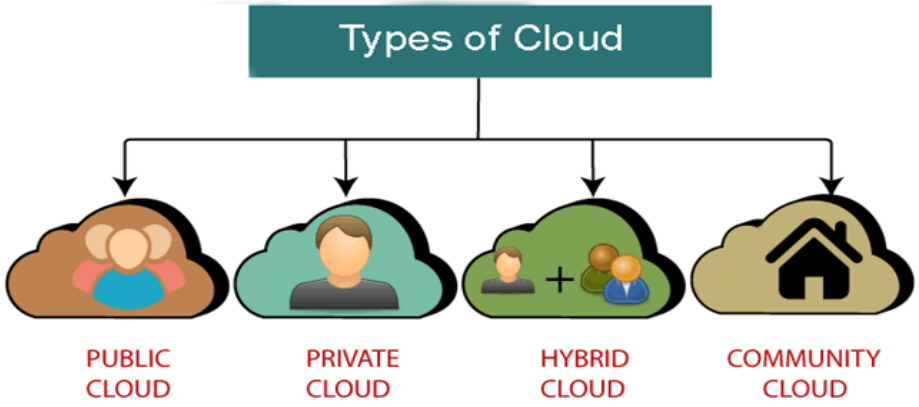
Cloud Computing

Cloud computing is the on-demand delivery of IT resources over the Internet with pay-as-you-go pricing. Instead of buying, owning, and maintaining physical data centers and servers, you can access technology services, such as computing power, storage, and databases, on an as-needed basis from a cloud provider like Amazon Web Services (AWS).

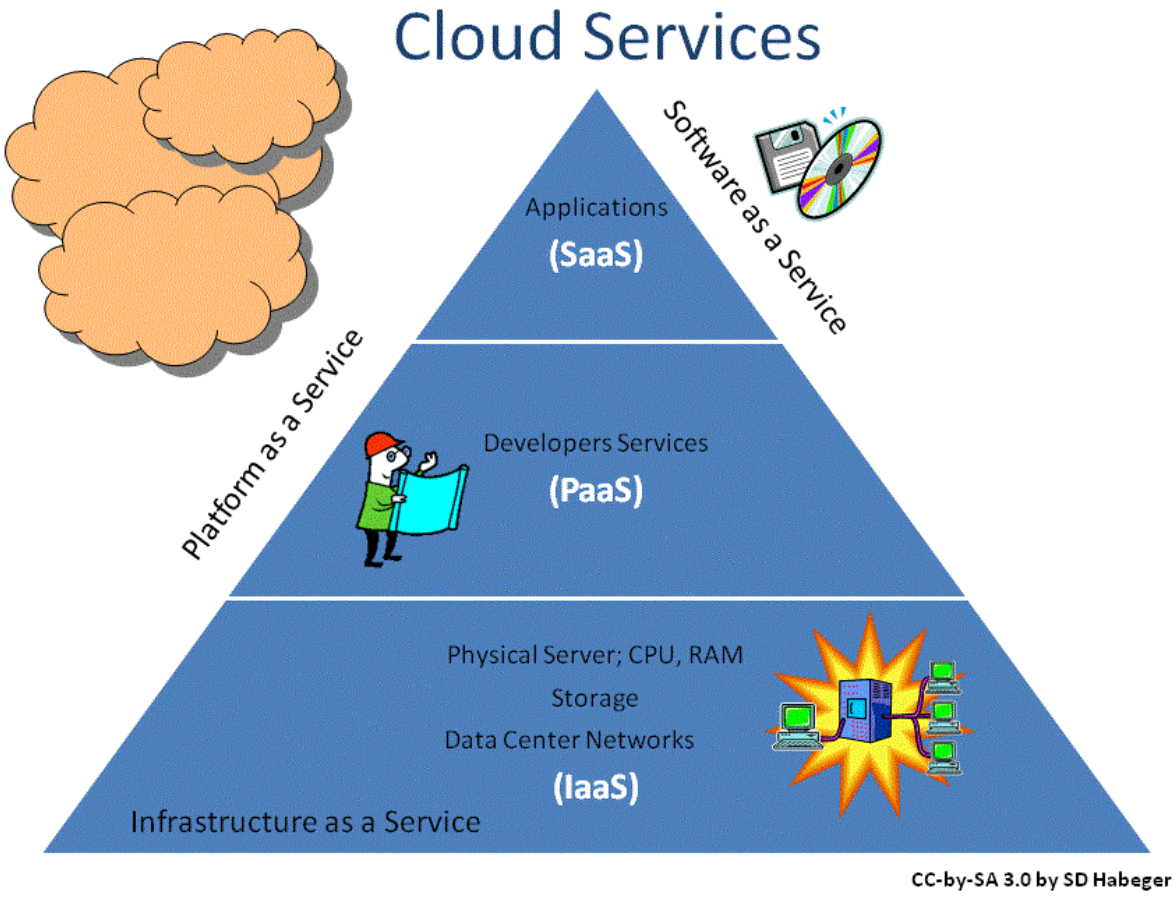


Types of Cloud

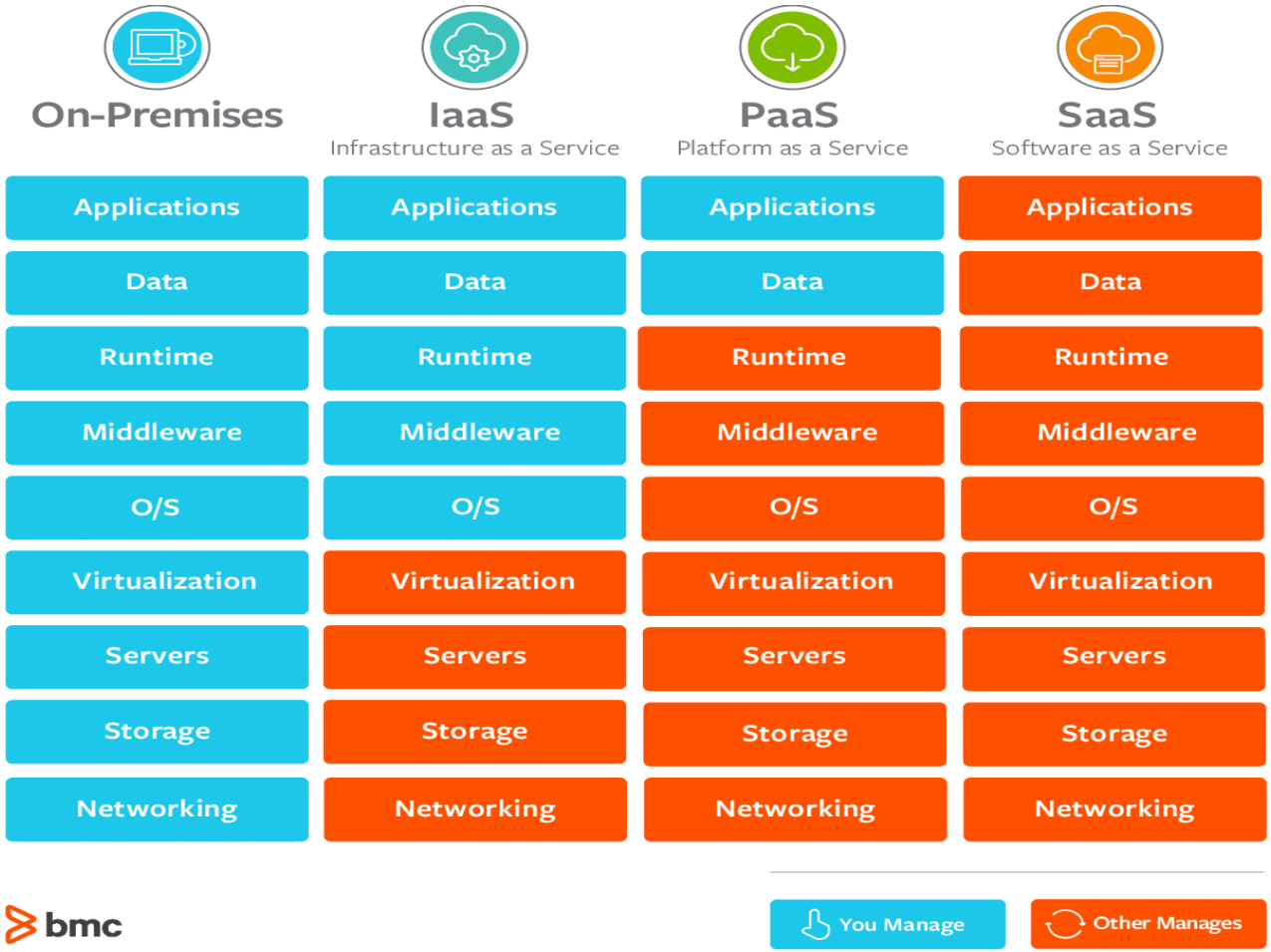
- **Public cloud** is open to all to store and access information via the Internet using the pay-per-usage method.
- **Private cloud** is also known as an internal cloud or corporate cloud. It is used by organizations to build and manage their own data centers internally or by the third party.
- **Hybrid Cloud** is a combination of the public cloud and the private cloud.
- **Community cloud** allows systems and services to be accessible by a group of several organizations to share the information between the organization and a specific community.



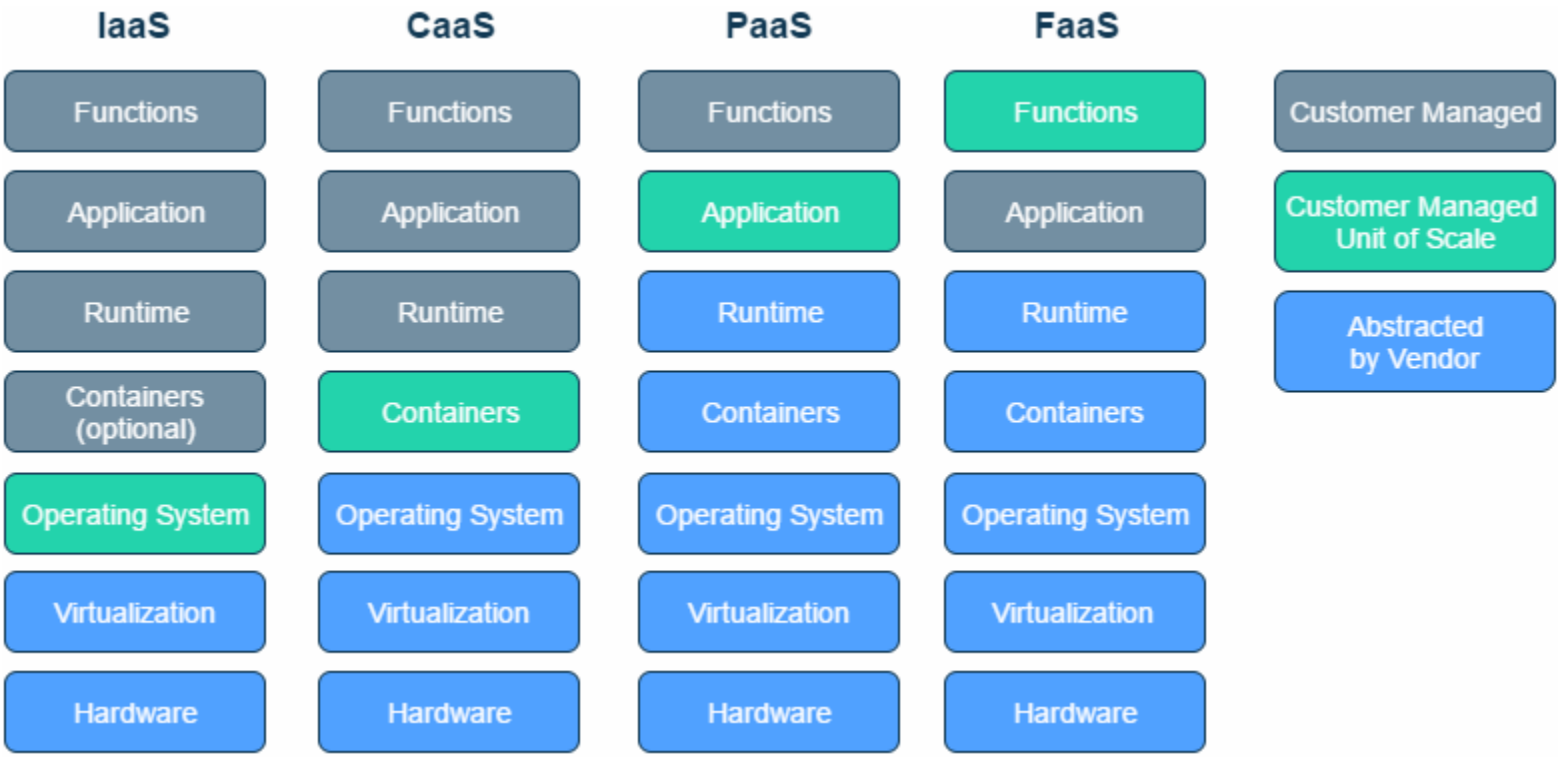
Cloud Service Models



Comparison of Cloud Service Models

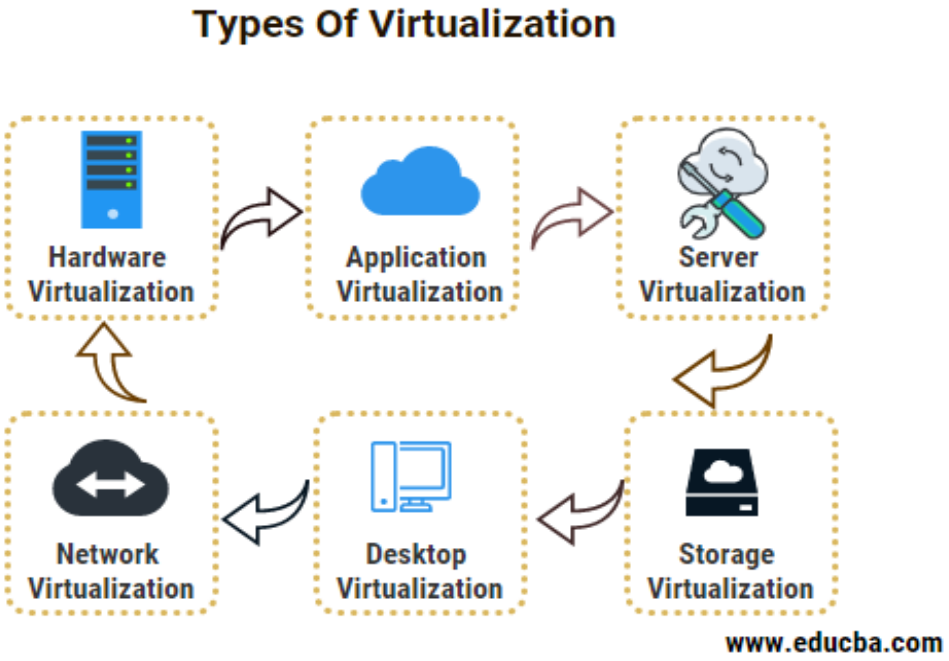


Comparison of Cloud Service Models



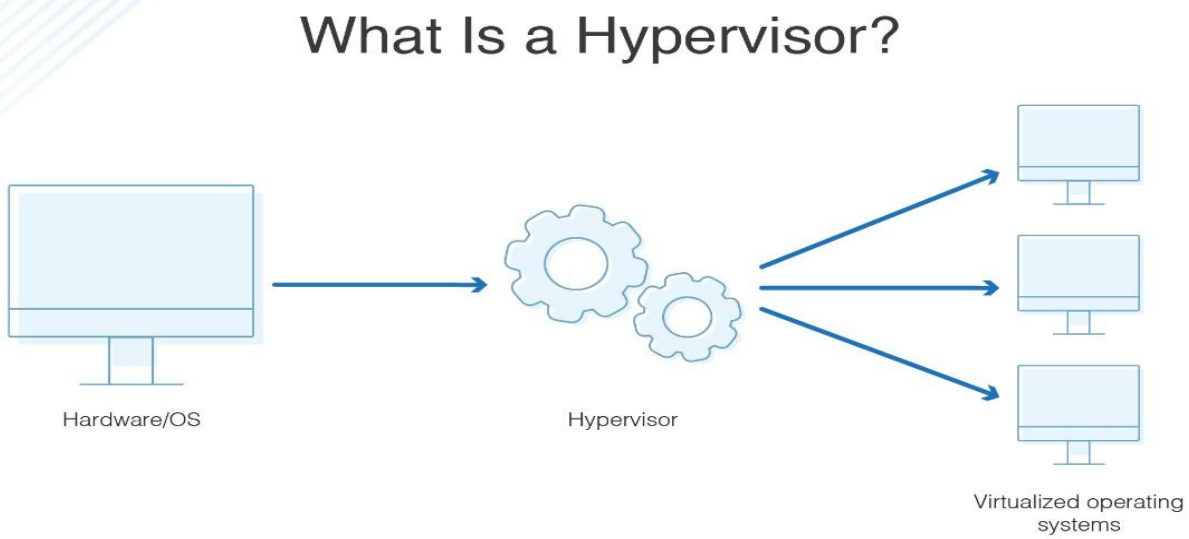
Types of Virtualization

Virtualization is the technology to generate virtual instances of computer resources for multiple uses of the same physical resource. There are several virtualization technologies available that are capable of virtualizing the server, storage, networks, and operating systems.

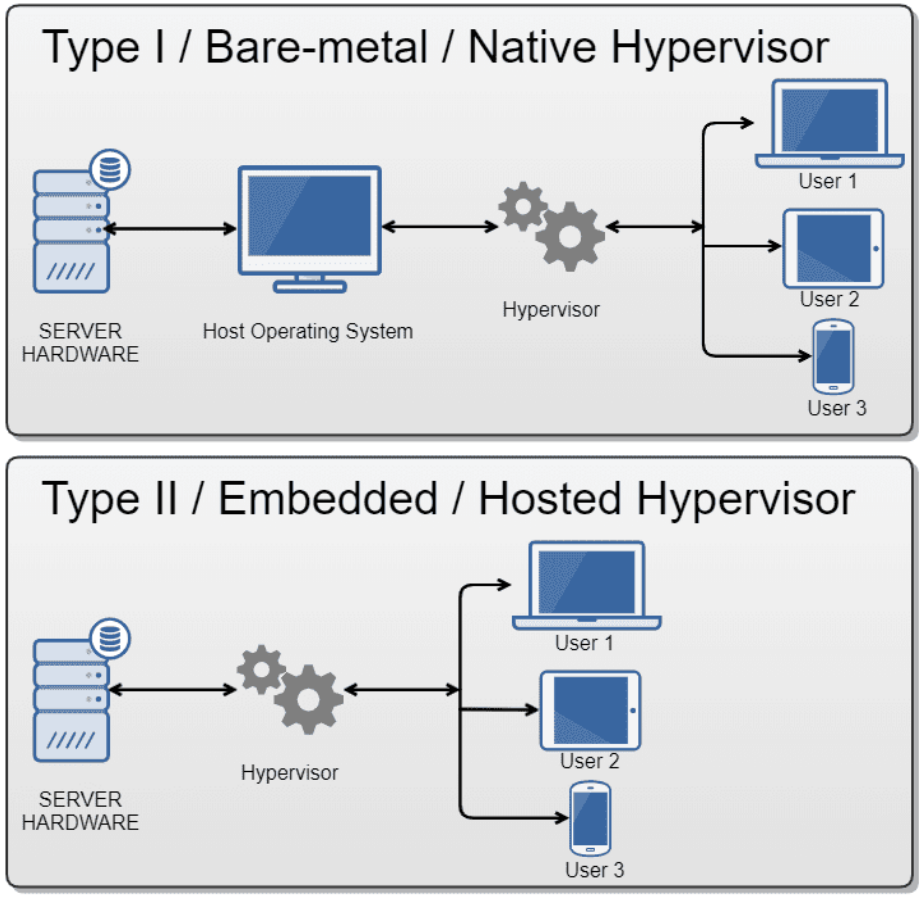


Hypervisor

A hypervisor is hardware, software, or firmware capable of creating virtual machines and then managing and allocating resources to them. Virtual machines are machines set up to use the resources of the host machine.



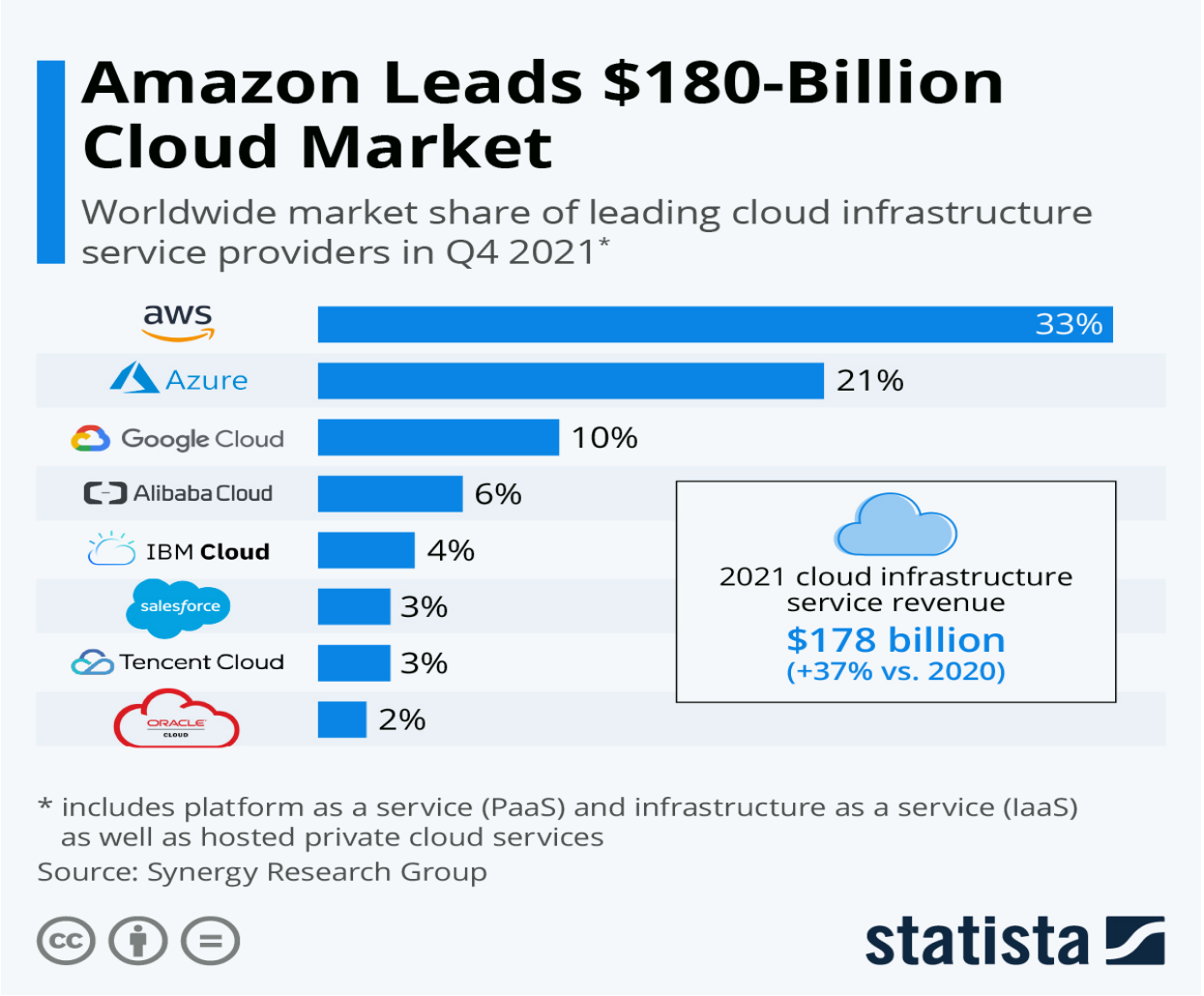
Types of Hypervisor



How Does a Hypervisor Work?

- They operate on the server level and can be either physical or virtual, and hardware or software-defined.
- They load the client operating systems of the VMs.
- It distributes the computing resources such as CPU, memory, bandwidth, and disk storage for each of the VMs. It does this by creating pools of hardware resources, which it then allocates to VMs.
- VMs can create requests for the hypervisor through API calls.

World Wide Cloud Market



Activity 5

Discussion on different websites such as google docs, mail, etc for reference of concepts